



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

09/640,928

08/17/2000

Morimichi Nishigaki

OAC-004

3276

959

7590

05/07/2004

LAHIVE & COCKFIELD, LLP.
28 STATE STREET
BOSTON, MA 02109

EXAMINER

PATEL, SHEFALI D

ART UNIT

PAPER NUMBER

2621

DATE MAILED: 05/07/2004

0

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/640,928

Applicant(s)

NISHIGAKI ET AL.

Examiner

Shefali D Patel

Art Unit

2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. The amendment to the claim 14 and response filed under 37 C.F.R. 1.116 has been received on April 05, 2004 and will be entered.
2. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

Response to Arguments

3. Applicant's arguments, see remarks (pages 9-13), filed on march 29, 2004, with respect to the rejection(s) of claim(s) 1-18 under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Suzuki et al (US 5,026,153) and Asayama (US 5,223,907).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 11-13, and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. (hereinafter, "Suzaki") in view of Asayama (US 5,223,907).

With regards to **claim 1**, Suzaki discloses an object recognition system mounted on a vehicle (Figs. 3, 10, 15), comprising: one or more sensors for capturing an image of an object (light source 1 on preceding vehicle 100, col. 7 lines 7-10; light receiving system 4 on a front

Art Unit: 2621

side of a self-vehicle 200, col. 7 lines 12-14); means for comparing (comparing means 7, Fig. 3); for each of the plurality of the windows, the measured distance with the estimated distance to determine if the measured distance belongs to the road surface (position comparing means 7 is comparing the position of the light source 1 (estimated distance, col. 7 lines 54-58) with the vehicle distance "L" which is the 'measured distance' with respect to the preceding vehicle 100 and the shift amount "d" of the driving lanes at col. 15 lines 61-65); estimating a relative inclination of the road surface against the vehicle based on the measured distances that are determined to be of the road surface (the relative inclination (i.e., deviation, relative velocity of the tracking vehicle) at col. 15 lines 65-68 to col. 16 lines 1-2 and also see, col. 8 lines 26-32 for pitch of the vehicle and reasons of vibrations); and means for modifying the estimated distances based on the inclination estimated by said inclination estimation means (modifying (i.e., correcting) distances "d" at col. 15 lines 65-68 to col. 16 lines 1-2 for adjusting the velocity of the tracking vehicle based on the estimated distance of the position of the light source 1 for possible vibrations and/or pitch). Suzuki does not expressly disclose measuring means for dividing the image into a plurality of windows and means for storing. Asayama discloses measuring means for dividing the image into a plurality of windows and measuring a distance to the road surface for each of a plurality of windows (dividing the surface image into plurality of windows 15, 16, 17, 18, and 19 at col. 2 lines 65-68); means for storing (memories 8 and 9), for each of the plurality of the windows, estimated distance to the road surface (col. 2 lines 58-59, col. 3 lines 8-26). Suzuki and Asayama are combinable because they are from the same field of endeavor, i.e., image processing of a surface by a system mounted on a moving vehicle. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to

Art Unit: 2621

combine the teaching of Asayama with Suzaki. The motivation for doing so is that by dividing the image into a plurality of windows, as does by Asayama, one can electrically detect the deviation of the two images from each other, thereby to measure the distance from the vehicle to the object with corresponds to the image in the window and the distances thus are measured as suggested by Asayama at col. 1 lines 67-68 to col. 2 lines 1-21. Also, it would have been obvious to a person of ordinary skill in the art to have a storing device in the light circuit system 2 in Suzaki for storing distances to the road surface. Suzaki does not expressly disclose having a storing means however, it is obvious to have storing means in order to later retrieve the predetermined position disclosed by Suzaki at col. 7 lines 54-58. Therefore, it would have been obvious to combine Asayama with Suzaki to obtain the invention as specified in claim 1.

Claim 11 recites identical features as claim 1 except claim 11 is a method claim. Thus, arguments similar to that presented above for claim 1 is equally applicable to claim 11.

With regards to **claim 12**, Asayama discloses extracting windows having captured the road surface from the plurality of windows (See, col. 2 lines 65-68), and wherein the step of inclination estimation estimates the inclination utilizing distances of the plurality of distances (pitch P of the picture elements at col. 3 lines 34-39), the utilized distances corresponding to the extracted windows. The distance is obtained at column 3 lines 25-30, the distance from the vehicle to the object selected with the window is also detected at col. 3 lines 39-47 and the widows capturing the road surface are shown in Figs. 2-4.

With regards to **claim 13**, Asayama discloses estimating distances to the road surface respectively for the plurality of windows based on the estimated inclination at, wherein windows are extracted based on the estimated distances in the step of extraction. (the distances to the road

Art Unit: 2621

surface respect to the object (rail guard in this case) is being estimated based on the inclination by determined the angles as disclosed at col. 3 lines 62 to col. 4 lines 1-53).

Claim 15 recites identical features as claim 1. Thus, arguments similar to that presented above for claim 1 is equally applicable to claim 15.

Claim 16 recites identical features as claim 12. Thus, arguments similar to that presented above for claim 1 is equally applicable to claim 16.

6. Claims 2-10, 14, and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view of Asayama as applied to claims 1, 11 and 15 above, and further in view of Shimoura et al. (hereinafter, "Shimoura") (USPN 5,638,116).

With regards to **claim 2**, Suzuki discloses a system where inclination is estimated as mentioned above in claim 1. However, Suzuki does not expressly disclose inclination estimation comprising: pitch estimating means for estimating slope of pitching of the vehicle as it travels and roll estimating means for estimating slope of roll of the vehicle as it travels. Shimoura discloses object recognition apparatus and a method in which Shimoura teaches estimating means for estimating slope of pitching of the vehicle as it travels and roll estimating means for estimating slope of roll of the vehicle as it travels at column 27 lines 34-48. Suzuki, Asayama and Shimoura are combinable because they are from the same field of endeavor, i.e., image processing of a surface by a system mounted on a moving vehicle. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the teaching of Shimoura with Asayama and Suzuki. The motivation for doing so is to estimate the inclination

Art Unit: 2621

of the road surface comprising estimating slope of pitching/roll of the vehicle in order to obtain high efficiency recognition of the object, especially, (as suggested by Shimoura) since the object moves in an image from moment to moment, it requires accurate camera/sensor attitude parameters (i.e., pitch angle and roll angle) representing the attitude of the camera/sensor with respect to the road surface. Therefore, it would have been obvious to combine Shimoura with Asayama and Suzuki to obtain the invention as specified in claim 2.

With regard to **claim 3**, Suzuki discloses estimating means for estimating the distance as described in claim 1 above. Suzuki does not expressly disclose a distance memory for storing each of the distance estimated. Asayama discloses memory 8 and 9 for storing each of the distance estimated at col. 3 lines 8-26 and Shimoura also discloses a memory 17 as discloses in Fig. 1. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have the memory unit for storage purpose and to use that storage data for later processing purposes.

With regards to **claim 4**, Asayama discloses judging means for comparing the distance measured by said measuring means for each window and the estimated distance estimated by said distance estimating means to determine relative to each window whether the window represents the road surface (the distances are being measured, compared for each windows representing the object and thus the object is being judged of it's existence. See, col. 3 lines 25-68 and col. 4 lines 1-10); and recognition means for recognizing the object based on a result from the judging means (depending on the angle between the object (i.e., the guard rail 5) with the distance to the road surface, the object and it's curvature is being recognized from the judging means of whether the angle is acute or obtuse. See, col. 4 lines 12-22).

Regarding **claim 5**, Asayama discloses judging means which extracts windows that represent object other than the road surface for transfer to said recognition means at col. 4 lines 12-31. Asayama predicts a curvature ahead of the vehicle determining an angle.

With regard to **claims 6 and 7**, Suzaki discloses inclination estimation means. However, Suzaki does not expressly disclose pitch/roll estimating means. Shimoura discloses pitch estimating means that determines pitch angle θ and roll angle α at column 27 lines 38 and 44, respectively.

Shimoura does not clearly disclose the pitch/roll angle according to the equation;

$$\tan \theta = \frac{n \sum Z_i Y_i - \sum Z_i \sum Y_i}{n \sum Z_i^2 - (\sum Z_i)^2}$$

and roll angle α according to the equation;

$$\tan \alpha = \frac{n \sum X_i Y_i - \sum X_i \sum Y_i}{n \sum X_i^2 - (\sum X_i)^2}$$

where X_i , Y_i and Z_i are x-axis, y-axis and z-axis positions respectively of i-th sample and n indicates the number of samples, x-axis being the direction of breather of the vehicle, y-axis being the direction of height of the vehicle and z-axis being the direction of travel of the vehicle. It would have been obvious matter of design choice to modify Shimoura's reference by having different parameters representing the x, y, and z-axis to obtain the angle. Shimoura discloses the x, y and z-axis at column 26 lines 20-48. It appears that the angles are obtained in the same manner with a different form, however they both have the same functionality to obtain the pitch/roll angle.

Art Unit: 2621

With regards to **claim 8**, the recited features are the same as those in claim 1, and the arguments in paragraph 5 above as to the relevance of Suzaki and Asayama are incorporated herein. An additional feature of correcting positioning error of said one or more sensors based on an average of the estimated inclination is disclosed by Shimoura at col. 38 lines 7-12 and col. 42 lines 55-67. Suzaki, Asayama and Shimoura are combinable because they are from the same field of endeavor, i.e., image processing of a surface thru a moving vehicle. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the teaching of Suzaki, Asayama and Shimoura. The motivation for doing so is that to correct the occurred position error to eliminate problems so that the system can take images properly. Therefore, it would have been obvious to combine Suzaki, Asayama and Shimoura to obtain the invention as specified in claim 8.

With regards to **claim 9**, the recited features are the same as those in claim 2-3, and the arguments in paragraph 6 above as to the relevance of Suzaki, Asayama and Shimoura are incorporated herein.

With regards to **claim 10**, Shimoura discloses the pitch/roll estimating means as explained above in claim 2. Further, Shimoura discloses sensor position estimating means for estimating deviation of the position of said one or more sensors from their specified position based on the pitch estimated by said pitch estimating means and the roll estimated by said roll estimating means; wherein the deviation of the position of said one or more sensors is determined based on moving average of the estimated pitch and the estimated roll at column 28 lines 30-35 and lines 37-42.

With regards to **claim 14**, Asayama discloses judging, for each of the plurality of windows, based on the estimated inclination, whether the object is an obstacle (i.e., guard rail) or the road surface at col. 4 lines 12-22; and recognizing the object based on the judgment result (col. 4 lines 23-31); obtaining, when the object has been judged as an obstacle in the judging step, a relative speed and a relative distance between the vehicle and the obstacle utilizing the image (the speed and distance between the obstacle and the moving body at col. 3 lines 25-68 to col. 4 lines 1-10); and Shimoura discloses sensing possible collision with the obstacle based on at least one of the relative speed and the relative distance; and performing collision avoidance action at column 35 lines 56-64.

With regards to **claim 17**, the recited features are the same as those in claims 1 and 3, and the arguments in paragraphs 5 and 6 above as to the relevance of Suzuki, Asayama and Shimoura are incorporated herein. Note: Asayama discloses memory 8 and 9 in Fig. 1; Shimoura discloses a memory 17 as discloses in Fig. 1.

Claim 18 recites identical features as claim 14. Thus, arguments similar to that presented above for claim 1 is equally applicable to claim 18.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 5,253,050;

Gerrish, et al., "Image Processing for Path-Finding in Agricultural Field Operations," ASAE Paper No. 85-3037, June 23-26, 1985.

Art Unit: 2621

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shefali D Patel whose telephone number is 703-306-4182. The examiner can normally be reached on M-F 8:00am - 5:00pm (First Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


DANIEL MARIAM
PRIMARY EXAMINER

April 22, 2004

Shefali D Patel
Examiner
Art Unit 2621